IN THE CLAIMS

1. (canceled)

2. (previously presented) A method in accordance with Claim 31 wherein x has a binary exponent e in addition to the binary mantissa m;

and further wherein computing a value of $\log(x)$ for the binary floating point representation of x comprises the steps of:

partitioning the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \frac{i + 0.5}{N}$; and

computing an approximation to $\log(x)$, using the first degree polynomial in the binary mantissa m and a precomputed value of $\log(a_i)$.

3. (previously presented) A method in accordance with Claim 2 wherein computing the approximation to $\log(x)$ comprises the step of computing an approximation written as:

$$\log(m) \approx \log(a_i) + \frac{(m - a_i)}{a_i};$$

where the reference point a_i is a closest reference point to the binary mantissa m of x; and

$$1 \le a_i < 2.$$

4. (canceled)

5. (currently amended) A method ~~in accordance with Claim 32~~ for computing an approximation of a natural logarithm function comprising the steps of:

partitioning an interval between 1 and 2 into N equally spaced sub-regions;

precomputing a reference point a_i of each of the N equally spaced sub-regions, where $i = 0,\ldots,N-1$;

selecting N sufficiently large so that, for each sub-region, a first degree polynomial in m computes $\log(m)$ to within a preselected degree of accuracy for any m within the sub-region, where m is a binary mantissa of a binary floating point representation of a variable x;

computing a value of $\log(x)$ for a binary floating point representation of x stored in a memory of a computing device utilizing the first degree polynomial in the binary mantissa m, wherein $\log(x)$ is a function of a distance between the reference point a_i and the binary mantissa m; and

generating an image by using the computed value of $\log(x)$, wherein x has a binary exponent e in addition to the binary mantissa m;

and further wherein computing a value of $\log(x)$ for the binary floating point representation of x comprises the steps of:

partitioning the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \dfrac{i + 0.5}{N}$;

computing an approximation to log(x), using the first degree polynomial in the binary mantissa m and a precomputed value of log(a_i), wherein computing an approximation to log(x) comprises the step of computing an approximation written as:

$$y = -\log(x) \approx b_i + c_i \Delta x + e \times \log(2)$$

for $i = 0, \ldots, N-1$

where:

$$b_i = -\log(a_i) + \left(\frac{1}{4a_i N}\right)^2 - \left(1 + \frac{1}{2N}\right)\frac{1}{a_i}; \text{ and}$$

$$c_i = -1/a_i;$$

~~further comprising the steps of~~

precomputing a value for ~~log(2), and,~~ log(2); and

for each i, precomputing each value of b_i and c_i.

6. (original) A method in accordance with Claim 5 further comprising the step of storing the precomputed values of b_i and c_i in a look-up table.

7. (previously presented) A method in accordance with Claim 2 wherein x is represented by a 32-bit representation having a sign bit, an 8-bit exponent, and a 23-bit binary mantissa having bits b_{22} to b_0 in order of significance with b_{22} being a bit of greatest significance; and the step of partitioning the binary mantissa m comprises the step of selecting a first group of bits b_{22} through b_{16} as index i and bits b_{15} through b_0 as Δx.

8. (previously presented) A method in accordance with Claim 31 utilized in a computed tomography (CT) scanner for generating an image of an object from acquired projection data of the object.

9. (original) A method in accordance with Claim 8 wherein said natural logarithm is used in an image reconstructor to generate the image of the object.

10. (previously presented) A method in accordance with Claim 8 wherein x has a binary exponent e in addition to the binary mantissa m;

and further wherein computing a value of $\log(x)$ for the binary floating point representation of x comprises the steps of:

partitioning the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \frac{i + 0.5}{N}$; and

computing an approximation to $\log(x)$, using the first degree polynomial in the binary mantissa m and a precomputed value of $\log(a_i)$.

11. (previously presented) A method in accordance with Claim 10 wherein computing the approximation to $\log(x)$ comprises the step of computing an approximation written as:

$$\log(m) \approx \log(a_i) + \frac{(m - a_i)}{a_i};$$

where the reference point a_i is a closest reference point to the binary mantissa m; and

$1 \le a_i < 2$.

12. (canceled)

13. (currently amended) A method ~~in accordance with Claim 33~~ for computing an approximation of a natural logarithm function comprising the steps of:

partitioning an interval between 1 and 2 into N equally spaced sub-regions;

precomputing a reference point a_i of each of the N equally spaced sub-regions, where $i = 0,\ldots,N-1$;

selecting N sufficiently large so that, for each sub-region, a first degree polynomial in m computes $\log(m)$ to within a preselected degree of accuracy for any m within the sub-region, where m is a binary mantissa of a binary floating point representation of a variable x;

computing a value of $\log(x)$ for a binary floating point representation of x stored in a memory of a computing device utilizing the first degree polynomial in the binary mantissa m, wherein $\log(x)$ is a function of a distance between the reference point a_i and the binary mantissa m;

generating an image by using the computed value of $\log(x)$, wherein x has a binary exponent e in addition to the binary mantissa m;

and further wherein computing a value of $\log(x)$ for the binary floating point representation of x comprises the steps of:

partitioning the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \dfrac{i + 0.5}{N}$; and

computing an approximation to $\log(x)$, using the first degree polynomial in the binary mantissa m and a precomputed value of $\log(a_i)$;

and further wherein computing an approximation to $\log(x)$ comprises the step of computing an approximation written as:

$$y = -\log(x) \approx b_i + c_i \Delta x + e \times \log(2)$$

for $i = 0, \ldots, N-1$

where:

$$b_i = -\log(a_i) + \left(\frac{1}{4a_iN}\right)^2 - \left(1 + \frac{1}{2N}\right)\frac{1}{a_i}; \text{ and}$$

$$c_i = -1/a_i;$$

~~further comprising the steps of~~

precomputing a value for ~~log(2), and,~~ log(2); and

for each i, precomputing each value of ~~b_i, and c_i.~~ b_i and c_i; and

said method utilized in a computed tomography (CT) scanner configured to generate an image of an object from acquired projection data of the object.

14. (original) A method in accordance with Claim 13 further comprising the step of storing the precomputed values of b_i and c_i in a look-up table.

15. (currently amended) A computing device comprising a memory in which binary floating point representations of particular numbers are stored, said device being configured to:

partition ~~a mantissa region~~ <u>an interval</u> between 1 and 2 into N equally spaced sub-regions;

precompute a reference point a_i of each of the N equally spaced sub-regions, where $i=0,\ldots,N-1$, wherein N is sufficiently large so that, within each sub-region, a first degree polynomial in m computes $\log(m)$ to within a preselected degree of accuracy for any m within the sub-region, where m is a mantissa of a binary floating point representation of a variable x;

compute a value of $\log(x)$ for a binary floating point representation of x stored in said memory utilizing the first degree polynomial in the binary mantissa m, wherein $\log(x)$ is a function of a distance between the reference point a_i and the binary mantissa m; and

generate an image by using the computed value of $\log(x)$.

16. (previously presented) A computing device in accordance with Claim 15 wherein x has a binary exponent e in addition to the binary mantissa m;

and wherein said device being configured to compute a value of $\log(x)$ for the binary floating point representation of x comprises said device being configured to:

partition the binary mantissa m of a binary representation of x in a memory of said device, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \frac{i + 0.5}{N}$; and

compute an approximation to $\log(x)$, using a polynomial of first degree in m and a precomputed value of $\log(a_i)$.

17. (previously presented) A computing device in accordance with Claim 16 wherein said device being configured to compute the approximation to $\log(x)$ comprises said device being configured to compute an approximation written as:

$$\log(m) \approx \log(a_i) + \frac{(m - a_i)}{a_i};$$

where the reference point a_i is a closest reference point to the binary mantissa m; and

$1 \le a_i < 2$.

18. (canceled)

19. (currently amended) A computing device ~~in accordance with Claim 35~~ in a computed tomography (CT) scanner and utilized by said CT scanner for calculating logarithms when said CT scanner generates an image of an object from acquired projection data of the object, said computing device comprising a memory in which binary floating point representations of particular numbers are stored, said device being configured to:

partition an interval between 1 and 2 into N equally spaced sub-regions;

precompute a reference point a_i of each of the N equally spaced sub-regions, where $i=0,...,N-1$, wherein N is sufficiently large so that, within each sub-region, a first degree polynomial in m computes log(m) to within a preselected degree of accuracy for any m within the sub-region, where m is a mantissa of a binary floating point representation of a variable x;

compute a value of log(x) for a binary floating point representation of x stored in said memory utilizing the first degree polynomial in the binary mantissa m, wherein log(x) is a function of a distance between the reference point a_i and the binary mantissa m; and

generate an image by using the computed value of log(x);

wherein x is stored with a binary exponent e in addition to the binary mantissa m;

and further wherein said device being configured to compute a value of log(x) for the binary floating point representation of x comprises said device being configured to:

partition the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from mantissa m to reference point $a_i = 1 + \frac{i + 0.5}{N}$; and

compute an approximation to log(x), using a polynomial of first degree in m and a precomputed value of log(a_i);

and further wherein said device being configured to compute an approximation to log(x) comprises said device being configured to compute an approximation written as:

$$y = -\log(x) \approx b_i + c_i \Delta x + e \times \log(2)$$

for $i = 0, \ldots, N-1$

where:

$$b_i = -\log(a_i) + \left(\frac{1}{4a_i N}\right)^2 - \left(1 + \frac{1}{2N}\right)\frac{1}{a_i}; \text{ and}$$

$$c_i = -1/a_i;$$

and said device is further configured to precompute a value for ~~log(2), and,~~ log(2); and

for each i, to precompute each value of b_i and c_i.

20. (original) A computing device in accordance with Claim 19 further configured to store the precomputed values of b_i and c_i in a look-up table.

21. (previously presented) A computing device in accordance with Claim 16 wherein x is represented by a 32-bit representation having a sign bit, an 8-bit exponent, and a

23-bit binary mantissa having bits b_{22} to b_0 in order of significance with b_{22} being a bit of greatest significance; and wherein said device being configured to partition the binary mantissa m comprises said device being configured to select a first group of bits b_{22} through b_{16} as index i and bits b_{15} through b_0 as Δx.

22. (original) A computing device in accordance with Claim 15 in a computed tomography (CT) scanner and utilized by said CT scanner for calculating logarithms when said CT scanner generates an image of an object from acquired projection data of the object.

23. (original) A computing device in accordance with Claim 22 wherein said CT scanner utilizes said computing device to calculate natural logarithm in an image reconstructor to generate the image of the object.

24. (previously presented) A computing device in accordance with Claim 22 wherein x is stored with a binary exponent e in addition to the binary mantissa m;

and further wherein said device being configured to compute a value of $\log(x)$ for the binary floating point representation of x comprises said device being configured to:

partition the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from mantissa m to reference point $a_i = 1 + \frac{i + 0.5}{N}$; and

compute an approximation to $\log(x)$, using a polynomial of first degree in m and a precomputed value of $\log(a_i)$.

25. (previously presented) A computing device in accordance with Claim 24 wherein said device being configured to compute the approximation to $\log(x)$ comprises said device being configured to compute an approximation written as:

$$\log(m) \approx \log(a_i) + \frac{(m - a_i)}{a_i};$$

where the reference point a_i is a closest reference point to the binary mantissa m; and

$1 \leq a_i < 2$.

26. (canceled)

27. (currently amended) A computing device ~~in accordance with Claim 34~~ comprising a memory in which binary floating point representations of particular numbers are stored, said device being configured to:

partition an interval between 1 and 2 into N equally spaced sub-regions;

precompute a reference point a_i of each of the N equally spaced sub-regions, where $i=0,\ldots,N-1$, wherein N is sufficiently large so that, within each sub-region, a first degree polynomial in m computes log(m) to within a preselected degree of accuracy for any m within the sub-region, where m is a mantissa of a binary floating point representation of a variable x;

compute a value of log(x) for a binary floating point representation of x stored in said memory utilizing the first degree polynomial in the binary mantissa m, wherein log(x) is a function of a distance between the reference point a_i and the binary mantissa m; and

generate an image by using the computed value of log(x), wherein x has a binary exponent e in addition to the binary mantissa m;

and wherein said device being configured to compute a value of log(x) for the binary floating point representation of x comprises said device being configured to:

partition the binary mantissa m of a binary representation of x in a memory of said device, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second,

less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \frac{i + 0.5}{N}$; and

compute an approximation to log(x), using a polynomial of first degree in m and a precomputed value of log(a_i);

and further wherein said device being configured to compute an approximation to log(x) comprises said device being configured to compute an approximation written as:

$$y = -\log(x) \approx b_i + c_i \Delta x + e \times \log(2)$$

for $i = 0, \ldots, N-1$

where:

$$b_i = -\log(a_i) + \left(\frac{1}{4a_i N}\right)^2 - \left(1 + \frac{1}{2N}\right)\frac{1}{a_i}; \text{ and}$$

$$c_i = -1/a_i;$$

~~further configured~~ and said device further configured to precompute a value for ~~log(2), and,~~ log(2); and

for each i, to precompute each value of b_i and c_i.

28. (original) A computing device in accordance with Claim 27 further configured to store the precomputed values of b_i and c_i in a look-up table.

29. (previously presented) A method in accordance with Claim 31 further comprising using the approximation to process at least one image of an object of interest.

30. (previously presented) A computing device in accordance with Claim 15, said computing device further configured to use the value of $\log(x)$ to process at least one image of an object of interest.

31. (currently amended) A method for computing an approximation of a natural logarithm function comprising the steps of:

partitioning ~~a mantissa region~~ an interval between 1 and 2 into N equally spaced sub-regions;

precomputing a reference point a_i of each of the N equally spaced sub-regions, where $i = 0, \ldots, N-1$;

selecting N sufficiently large so that, for each sub-region, a first degree polynomial in m computes $\log(m)$ to within a preselected degree of accuracy for any m within the sub-region, where m is a binary mantissa of a binary floating point representation of a variable x;

computing a value of $\log(x)$ for a binary floating point representation of x stored in a memory of a computing device utilizing the first degree polynomial in the binary mantissa m, wherein $\log(x)$ is a function of a distance between the reference point a_i and the binary mantissa m; and

generating an image by using the computed value of $\log(x)$.

32. (currently amended) A method ~~in accordance with Claim 2~~ for computing an approximation of a natural logarithm function comprising the steps of:

partitioning an interval between 1 and 2 into N equally spaced sub-regions;

precomputing a reference point a_i of each of the N equally spaced sub-regions, where $i = 0, \ldots, N-1$;

selecting N sufficiently large so that, for each sub-region, a first degree polynomial in m computes $\log(m)$ to within a preselected degree of accuracy for any m within the sub-region, where m is a binary mantissa of a binary floating point representation of a variable x;

computing a value of $\log(x)$ for a binary floating point representation of x stored in a memory of a computing device utilizing the first degree polynomial in the binary mantissa m, wherein $\log(x)$ is a function of a distance between the reference point a_i and the binary mantissa m; and

generating an image by using the computed value of $\log(x)$, wherein x has a binary exponent e in addition to the binary mantissa m;

and further wherein computing a value of $\log(x)$ for the binary floating point representation of x comprises the steps of:

partitioning the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \frac{i + 0.5}{N}$; and

computing an approximation to $\log(x)$, using the first degree polynomial in the binary mantissa m and a precomputed value of $\log(a_i)$;

wherein computing an approximation to $\log(x)$ comprises the step of computing an approximation written as:

$$y = -\log(x) \approx b_i + c_i \Delta x + e \times \log(2)$$

for $i = 0, \ldots, N-1$

where:

$$b_i = -\log(a_i) + \left(\frac{1}{4a_i N}\right)^2 - \left(1 + \frac{1}{2N}\right)\frac{1}{a_i}\text{; and}$$

$$c_i = -1/a_i.$$

33. (currently amended) A method ~~in accordance with Claim 10~~ for computing an approximation of a natural logarithm function comprising the steps of:

partitioning an interval between 1 and 2 into N equally spaced sub-regions;

precomputing a reference point a_i of each of the N equally spaced sub-regions, where $i = 0,\ldots,N-1$;

selecting N sufficiently large so that, for each sub-region, a first degree polynomial in m computes $\log(m)$ to within a preselected degree of accuracy for any m within the sub-region, where m is a binary mantissa of a binary floating point representation of a variable x;

computing a value of $\log(x)$ for a binary floating point representation of x stored in a memory of a computing device utilizing the first degree polynomial in the binary mantissa m, wherein $\log(x)$ is a function of a distance between the reference point a_i and the binary mantissa m; and

generating an image by using the computed value of $\log(x)$, wherein x has a binary exponent e in addition to the binary mantissa m;

wherein said method is utilized in a computed tomography (CT) scanner for generating an image of an object from acquired projection data of the object;

and further wherein computing a value of $\log(x)$ for the binary floating point representation of x comprises the steps of:

partitioning the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \frac{i+0.5}{N}$; and

computing an approximation to log(x), using the first degree polynomial in the binary mantissa m and a precomputed value of log(a_i);

and further wherein computing an approximation to log(x) comprises the step of computing an approximation written as:

$$y = -\log(x) \approx b_i + c_i \Delta x + e \times \log(2)$$

for $i = 0, \ldots, N-1$

where:

$$b_i = -\log(a_i) + \left(\frac{1}{4a_i N}\right)^2 - \left(1 + \frac{1}{2N}\right)\frac{1}{a_i}; \text{ and}$$

$$c_i = -1 / a_i.$$

34. (currently amended) A computing device ~~in accordance with Claim 16~~ comprising a memory in which binary floating point representations of particular numbers are stored, said device being configured to:

partition an interval between 1 and 2 into N equally spaced sub-regions;

precompute a reference point a_i of each of the N equally spaced sub-regions, where $i=0,\ldots,N-1$, wherein N is sufficiently large so that, within each sub-region, a first degree polynomial in m computes log(m) to within a preselected degree of accuracy for any m within the sub-region, where m is a mantissa of a binary floating point representation of a variable x;

compute a value of log(x) for a binary floating point representation of x stored in said memory utilizing the first degree polynomial in the binary mantissa m, wherein log(x) is a function of a distance between the reference point a_i and the binary mantissa m; and

generate an image by using the computed value of log(x), wherein x has a binary exponent e in addition to the binary mantissa m;

and wherein said device being configured to compute a value of log(x) for the binary floating point representation of x comprises said device being configured to:

partition the binary mantissa m of a binary representation of x in a memory of said device, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from the binary mantissa m to the reference point $a_i = 1 + \frac{i+0.5}{N}$; and

compute an approximation to log(x), using a polynomial of first degree in m and a precomputed value of log(a_i);

and further wherein said device being configured to compute an approximation to log(x) comprises said device being configured to compute an approximation written as:

$$y = -\log(x) \approx b_i + c_i \Delta x + e \times \log(2)$$

for $i = 0, \ldots, N-1$

where:

$$b_i = -\log(a_i) + \left(\frac{1}{4a_i N}\right)^2 - \left(1 + \frac{1}{2N}\right)\frac{1}{a_i}; \text{ and}$$

$$c_i = -1/a_i.$$

35. (previously presented) A computing device ~~in accordance with Claim 24~~ comprising a memory in which binary floating point representations of particular numbers are stored, said device being configured to:

partition an interval between 1 and 2 into N equally spaced sub-regions;

precompute a reference point a_i of each of the N equally spaced sub-regions, where $i=0,\ldots,N-1$, wherein N is sufficiently large so that, within each sub-region, a first degree polynomial in m computes $\log(m)$ to within a preselected degree of accuracy for any m within the sub-region, where m is a mantissa of a binary floating point representation of a variable x;

compute a value of $\log(x)$ for a binary floating point representation of x stored in said memory utilizing the first degree polynomial in the binary mantissa m, wherein $\log(x)$ is a function of a distance between the reference point a_i and the binary mantissa m; and

generate an image by using the computed value of $\log(x)$, wherein x is stored with a binary exponent e in addition to the binary mantissa m;

said device in a computed tomography (CT) scanner and utilized by said CT scanner for calculating logarithms when said CT scanner generates an image of an object from acquired projection data of the object;

and further wherein said device being configured to compute a value of $\log(x)$ for the binary floating point representation of x comprises said device being configured to:

partition the binary mantissa m of a binary representation of x in a memory, the representation of x including a binary exponent e and the binary mantissa m, wherein a first, most significant part of the partition corresponds to a region i and a second, less significant part of the partition corresponds to a region Δx, where Δx is a distance from mantissa m to reference point $a_i = 1 + \frac{i + 0.5}{N}$; and

compute an approximation to log(x), using a polynomial of first degree in m and a precomputed value of log(a_i);

and further wherein said device being configured to compute an approximation to log(x) comprises said device being configured to compute an approximation written as:

$$y = -\log(x) \approx b_i + c_i \Delta x + e \times \log(2)$$

for $i = 0, \ldots, N-1$

where:

$$b_i = -\log(a_i) + \left(\frac{1}{4a_i N}\right)^2 - \left(1 + \frac{1}{2N}\right)\frac{1}{a_i}; \text{ and}$$

$$c_i = -1/a_i.$$

36. (previously presented) A computing device in accordance with Claim 15 wherein the reference point a_i is a centerpoint of each of the N equally spaced sub-regions.

37. (previously presented) A method in accordance with Claim 31 wherein precomputing a reference point a_i of each of the N equally spaced sub-regions comprising precomputing a centerpoint of each of the N equally spaced sub-regions.